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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/909,488	07/20/2001	Harapanahalli S. Muralidhara	11936.15US01	2586

23552 7590 11/18/2004

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EXAMINER	
FORTUNA, ANA M	
ART UNIT	**PAPER NUMBER**
1723	

DATE MAILED: 11/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/909,488	MURALIDHARA ET AL.
	Examiner	Art Unit
	Ana M Fortuna	1723

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 August 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 15, 30, 40 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Product claims 15, 30,and 40 can be made by using another apparatus or method, e.g. using reverse osmosis, loose reverse osmosis membranes, in combination with other water treatment and/or pre-treatments.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 15, 30, 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Collentro et al (5,670,053)(hereinafter '053). Reference '053 water product produced by softening water by nanofiltration, e.g. NF-70, the water is reduced in hardness ions and 90 % of calcium is reduced by the process, e.g. pretreatment step (column page 5, lines 42-68, and column 6, lines 1-17).

> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 15, 30, 40 are rejected under 35 U.S.C. 102(e) as being anticipated by Hassan et al (6,508,936)(hereinafter Hassan). Hassan discloses producing softened water produced by nanofiltration and containing less than 20 % of calcium, and low harness ions (Figs. 2, and 9, column 7, last paragraph bridging column 8, lines 24-31, and column 9, lines 1-55).

Claims 1-10, 13-25, 27-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Lalshminarayan P. Raman (Article "Considering Nanofiltration for Membrane Separations")(Hereinafter Raman). Raman discloses different operating processes and apparatus including nanofiltration membranes and the NF membrane properties, more specifically, and apparatus arranged for softening water including the structure claimed in claims 1 and 16, and two nanofiltration stages is shown (entire article, table 1, Fig. 3, section "demineralizing water" (producing potable water). The membrane arrangement for producing potable water in Raman reduces hardness between 85-95 %, and over 70 % of monovalent ions. Suitable membranes include NF-70 (From Film Tech (Dow), which has a water permeability of 72.0 L/M2//Mpa, sodium

chloride rejection of 70%, and divalent ions ejection of 98 %. The Calcium rejection (hardness) is between 85-95 %. The percentage of output flow is not disclosed, however, seems to be inherent of the membrane, and the membrane operating conditions, e.g. inlet water composition, operating pressure, and membrane high water permeability (e.g. 72 L/M2/hr.Mpa). As to claims 2-8, 12-13, 27, 29, these conditions are depending on apparatus operation and not on apparatus structure, however, based on the disclosed membrane properties and operating pressures, which are known to be lower than 300 psi, the apparatus can be considered to inherently have the claimed properties. Regarding claim 2, the apparatus of Raman includes a feed pump, which can be operated at a desire pressure level for nanofiltration. As to claim 10, the NF-70.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-10, 13-25, 27-30, 31-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lalshminarayan P. Raman ("Considering Nanofiltration for Membrane Separations")(Hereinafter Raman) in view of Binder et al (5,869,297 (hereinafter Binder). Raman, discussed above, discloses the apparatus structure including the nanofiltration membranes, in particular NF-70, and its use in producing potable water. A detailed membrane specification of inherent membrane properties,

such as, optimum operating range pressure range, and performance for treatment of tap water source treatment, e.g. flux, of the membrane and salt retention is not discussed in Raman.

Binder teaches NF-70 specification and inherent membrane performance data, an apparatus provided with the membrane, and having inlet for the feed, e.g. Water or other liquid, and permeate and retentate outlet are shown in figures 2-3. In Binder the NF-70 specifications are disclosed, as operating pressure between 70-300 psig, as pertaining to claims 2, 22, 25, 34, 35 (column 3, lines 30-68, in particular lines 42-61, and column 4, lines 1-15). In the cited section of column 4 of Binder, a sodium chloride rejection of 80 % in tap water is disclosed for he NF-70. The membrane permeate rate is between 600 to 7500 GFD, and 96 % of divalent ions rejection, therefore, the percentage of permeate with respect to the feed as claimed can be achieve by the membrane, since the membrane permeate flow rate is within the values claimed in claims 4, 8, 21, ad 39.

Regarding claims 27,13, 28, 38, from the membrane rejection performance, as disc used in Raman and Binder, the final water hardness can be determined from the particular concentration of the potable water feed to the membrane, therefore, one skilled in the art at the time the invention was made will conclude that if water with the same composition is feed to the membrane, and the same membrane arrangement is use, e.g. multiple membranes is series, or a single membrane, NF-70, which includes the rejection properties claimed, the final concentration of the permeate water is the same, under the same operating pressure and pH conditions.

Regarding claims 9, 32, the retention of divalent ions is disclosed in both references, see Raman Table 1, last two columns), wherein, not substantial salt concentration is also shown for the NF-70. Binder teaches the divalent retention, e.g. magnesium sulfate (column 3, lines 55-61).

5. Claims 11, 26 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Raman or Raman in view of Binder as applied to claims 1, 16 and 31 above, and further in view of Applicant's disclosure. The discussed reference above discloses the apparatus provided with nanofiltration membrane including the claimed properties, and the use in water or tap water purification. The membrane with positive charge is not disclosed; the NF-70 is disclosed as negatively charged nanofiltration membrane. Applicant discloses the membrane as non critical in terms of charge, since any membrane meeting the performance conditions claimed could be used in the process, and further discloses, in specification, page 11 a SRI membrane as suitable for the process (assume positively charged) or apparatus. It would have been obvious to one skilled in the art to use SRI membranes in an apparatus having a housing with an inlet and outlet, and further process water, as membrane softening, as suggested in Raman and Binder for nanofiltration membranes in general, the salt retention, operating conditions and flux are inherent of the admitted known membrane, when operated at the suggested membrane specifications.

6. Claims 1, 5, 6, 9, 16, 31-32, 37, 40, 17, 18, 19, 23, 30 rejected under 35 U.S.C. 103(a) as being unpatentable over Hassan (WO 99/16714 9corresponding to US 6,508,936)(hereinafter Hassan. Hassan discloses a process and apparatus for treating

water in a softening step, including a nanofiltration membrane (s) and provided with the housing including inlet and outlets and a water source connected to the nanofiltration membrane, the membrane performance including calcium, divalent ions, and salt rejection values claimed is disclosed (WO abstract and figures, Table 4, pages 16-17). The nanofiltration recovery is disclosed as higher than 60 % for the nanofiltration stage is disclosed, e.g. by adjusting the pH to a neutral value (page 15, last paragraph, bridging page 16,lines 1-2). A recovery oft 80 % is not disclosed, however, higher than 60 % a 70 psi is disclosed by the reference. It would have been obvious to one skilled in the art at the time the invention was made to adjust performance parameters and pH in order to obtain the claimed recovery, e.g. increasing pressure, pretreatment to reduce feed salt content, increase the number of NF stages, etc. to obtain the claimed recovery. Hassan teaches using the membranes disclosed by Raman (discussed above) which includes using NF-70 as nanofiltration membranes, which as discussed above, inherently possesses the claimed rejection values(page 12, last paragraphs).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Reference to K.Ikeda et al, Fu et al., 5,755,964, 5,858,240, 6,783,682, have been cited as teaching performance of nanofiltration membranes and apparatus containing the membrane for water and other solutions purification.

Response to Arguments

7. Applicant's arguments with respect to claims 1-40 have been considered but are moot in view of the new ground(s) of rejection. The articles used in the previous rejection although do not show a prior publication date with respect to the application, support the admission that the membrane is known in the art (SRI).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ana M Fortuna whose telephone number is (571) 272-1141. The examiner can normally be reached on 9:30-6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda L. Walker can be reached on (571) 272-1151. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ana M Fortuna
Primary Examiner
Art Unit 1723

AF